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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНИТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНИТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman** (**Кириллица**), для текста на грузинском языке следует использовать **AcadNusx.** Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - http://www.spinesurgery.ru/files/publish.pdf и http://www.nlm.nih.gov/bsd/uniform_requirements.html
В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректура авторам не высылается, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or compu-ter-printed on a single side of standard typing paper, with the left margin of **3** centimeters width, and **1.5** spacing between the lines, typeface - **Times New Roman** (**Cyrillic**), print size - **12** (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf
In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

Articles that Fail to Meet the Aforementioned Requirements are not Assigned to be Reviewed.

ავტორთა საყურადღებოდ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე,დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx.** შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შეღებვის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფჩხილებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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CHROMATOGRAPHIC SPECTROPHOTOMETRIC DETERMINATION USING REVERSE PHASE HPLC TECHNIQUE FOR MESALAZINE OR MESALAMINE (MESA)

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Abstract.

Aim: The aim of this paper is to estimate Mesalazine or Mesalamine (MESA) in pharmaceuticals.

Methodologies: The reversed-phase HPLC (RP-HPLC) results were used to evaluate the type of Mesalazine. Chromatographic analysis was carried out using an HPLC-UV method along with an Ion Pac column (Arcus EP-C18; 5 m, 4.6 mm, 250 mm) and a mobile phase of acetonitrile: acetic acid: water, 40:40:20 (v/v/v) + 0.5 M potassium dihydrogen orthophosphate buffer at pH 3.3, at a flow rate of 1.0 ml/min. At 260 nm, UV detection was employed in the HPLC method. Exactness, precision, particularity, linearity, and affectability were all accepted for the technique. The (MESA) had a maintenance time of (3.17) minutes. The (MESA) alignment plots were over the target ranges of 1–5 g/L, R^2 0.9998. The quantitation limit was 0.3613 g/ml, with a detection limit of 1.636 g/ml. The precision of the proposed procedure, which ranged from 98.0 percent to 100 percent, was determined through recovery experiments.

Conclusion: The modern HPLC-UV approach was used to analyze generic drug products, and the planned technique's efficiency was confirmed. The study's findings show that precision, accuracy, and efficiency are all within reasonable limits, so there is no substantial difference between the values obtained using the proposed methodology and those obtained using the traditional method.

Key words. Mesalazine (MESA) chromatographic, mesalamine degradation, mesalamine crud.

Introduction.

Mesalazine (MESA), also named mesalamine, its chemical name is 5-amino-2-hydroxy benzoic acid. The powder or crystals of MESA has a white or light grey or light pink color (Britishpharmacopia, 2013). It is soluble in oil. acidic and alkaline medium, fairly insoluble in chloroform, ether, ethyl acetate, and n-hexane [1].

Mesalamine (Figure 1) also known as Mesalazine or 5-amino salicylic acid (5-ASA), is an anti-inflammatory drug used to treat inflammatory bowel diseases, such as ulcerative colitis and mild-to-moderate Crohn's disease. Mesalamine is a bowel-specific aminosalicylate drug that acts locally in the gut and has its predominant actions, thereby having few systemic side effects. As a derivative of salicylic acid, Mesalamine is also thought to be an antioxidant that traps free radicals, which are potentially damaging byproducts of metabolism. Mesalamine is considered the active moiety of Sulfasalazine, which is metabolized to Sulfapyridine and Mesalamine. A literature survey revealed that a few analytical methods have been reported for the determination of Mesalamine in pure drug, pharmaceutical dosage forms, and biological samples using spectrophotometry, HPLC, UPLC, and LC-MS either in single or in combined forms. The aim of the present work is to develop and validate a simple, fast, and reliable isocratic RP-HPLC method with UV detection for the determination of Mesalamine in bulk and in tablet dosage forms. Confirmation of the applicability of the developed method was validated according to the International Conference on Harmonization (ICH) for the determination of Mesalamine in bulk and tablet dosage forms [2-9].

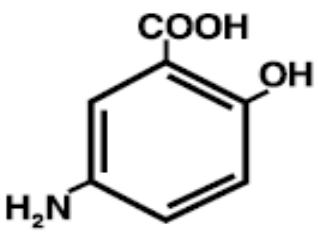

Figure 1. *Passive external rotation of the shoulder while lying on the back.*

Synthesis of Mesalamine.

The synthetic step in the synthesis disclosed therein is the reaction of a cyano group on the biphenyl ring with an azide, such as tributyl tin azide. as follows:

Synthesis of Mesalazine

The current study's aim was to establish and validate an RP-HPLC system with an ultraviolet (UV) detector for quantitative Mesalazine determination in pharmaceuticals.

Experiment.

Tools:

Completely automatic digital computer control is standard on the LC-100 series S-HPLC. Its electronic circuit design, internal mechanical construction techniques, processing technology, cinematography workstation functions, and technical requirements make it one of the most stable and reliable instruments available double-beam optical spectrometer (Angstrom Advanced Inc. USA), a sort UV-100 PC with a 1 cm light frequency quartz cell, and an IBM compatible PC make up the LC100-style HPLC-UV. The replica was made out of UPVC. PLS Toolbox for Matlab R2003b, VP pumps, and a UV indicator with variable frequency programming, as well as PLS Toolbox for Matlab R2003b, chemometric techniques, and the halfway least squares process, were all great (PLS). An Angstrom Developed Inc. LCsolution programming tool was used to coordinate peakareas. An Ion Pac segment and an ArcusEP-C18 analyticalcolumn were used to conduct the chromatographic separation and measurement at room temperature (250 mm 4.6 mm; molecule size 5 m). Before

being injected into the HPLC device, drug standard and tablet test arrangements were processed via a millipore layer channel in the portable stage [10-12].

Chemicals and Reagents.

Pure Standard: Mesalazine (MESA) with a quality assertion of 99.9 percent, granted by Industries Pharma SIGMA-ADRICH.COM CHEM Gmbh, MKCH4095, under the number A79809-5GM for medical devices and pharmaceuticals, depending on the company's factory certificate. Mesalazine - SIGMA-ADRICH®, Germany.

Market Sample: Mesalazine - Pentasa-tablets Ferring®, Switzerland, contains 500 mg per Pentasa-tablets, Match no: T13613A.

Set up the Samples for Measuring:

• Sigma-Aldrich® HPLC grade solution

• To prepare a concentration of 1 mg/ml from MESA, stock standard solutions were prepared in Methanol: chloroform (25:75) and 1 mM acetic acid at pH 3.3.

• MESA (standard solution) concentrations of 1.0, 2.0, 3.0, 4.0, and 5.0 g/ml were prepared in a mobile phase of acetonitrile: acetic acid: water, 40:40:20 (v/v/v) + 0.5 M potassium dihydrogen orthophosphate buffer at pH 3.3, at a flow rate of 1.0 ml/min. At λ_{max} 260 nm, with an Ion Pac column (Arcus EP-C18; 5 m, 4.6 mm, 250 mm).

Modernization example: To conduct sample Modernization, various examples of mesalazine - Pentasa-tablets Ferring® containing known amounts from standard MESA-500 mg tablets developed by Ferring® were added to the streamlined PLS alignment package. One known emphasis on three oblique convergences of measures, each of which was divided into different groupings, was included as a justification for performing the fundamental modification and the updated example's precognitive capacity was assessed using outer approval tests, then figure out how to conduct test refreshing for each section using the produced strategy. In the RP-HPLC, three centralizations of additional refreshing examples were used.

Results.

Procedure and Standard Drug Remedy:

In traditional setups, the mobile phase is commonly used as a solvent. Dissolving a clearly specified quantity of MESA (50 mg) in 100 ml of flexible stage in a 250 ml volumetric flagon yielded a normal stock arrangement of Mesalazine (500 g/ml). The cup was therefore made suitable using the portable stage. MESA working standard arrangements (1, 2, 3, 4, and 5 g/ml) were created after the stock arrangement was adequately undermined with the changed number.

Chromatographic Parameters:

Table 1 shows the critical parameter values acquired by utulizing reverse-phase chromatography process. (High-performance liquid chromatography, or RP-HPLC).

The proposed strategy's Calibration Curve:

Alignment bends were prepared over a focus range of 1–5 g/ml for Mesalazine. The three-fold arrangement was prepared, and 20 µL of each arrangement was injected onto the section. At 260 nm, the pinnacles were resolved. mesalazine 's adjustment bend was created by plotting the pinnacle zone versus concentration.

Table 1. *Shows the values of the basic parameters obtained using the reverse-phase chromatography system (RP-HPLC).*

Mobile phase	acetonitrile: acetic acid: water, 40:40:20 (v/v/v) + 0.5 M potassium dihydrogen orthophosphate buffer at pH 3.3
Run time	10 min
Retention time	3.17 min
Column temperature	25°C
Detection wavelength	260 nm
Flow rate	1.0 ml/minute
Injection volume	20 µL

Exercising degradation Research:

Different ICH-recommended pressure conditions, such as acidic, basic, oxidative, wet, and photolytic effort, were used in the effort degradation studies [13-20].

Acid degradation:

In a 100 ml volumetric cup, 500 mg of Mesalazine tablet powder was taken. The jar being loaded with 5 mL 0.1 N HCl and held at 70-80°C in a reflux state for 2–3 hours. The arrangement was killed with 0.1 N NaOH after the strain was reached, and the flexible stage was used to finish the job. Hydrochloric acid can be used to break down Mesalazine. Hydrolysis, or water splitting, is one such reaction. ”Any acid or base stimulates amine hydrolysis (Figure 2).

Base degradation:

By using sources to suppress amine, such as NaOH or potassium hydroxide, the product is amine salt. In a 100 ml volumetric carafe, 500 mg of Mesalazine tablet powder was taken. The jar being loaded with 5 mL 0.1 N NaOH and held at 70-80°C in a reflux state for 2–3 hours. A dynamic stage was used to complete the structure after it was killed with 0.1 N HCl and after the pressure was completed (Figure 3).

Oxidative degeneration:

In a 100 ml volumetric flask, 500 mg of MESA tablet powder and 5 ml of 20% H_2O_2 were combined. For 2–3 hours, the flask was held at 70-80°C in a reflux state. The jar was finished sufficiently with the portable stage after the pressure culmination (Figure 4).

Degradation due to photolysis:

For the photolytic degradation analysis, 500 mg of Mesalazine e tablet powder is being put in a glass Petri dish and exposed to direct sunlight for 2–3 hours. The tablet powder is being moved to a 100 mL volumetric cup and formed suitable with the portable amount after applying pressure. The solution's infrared spectrum is then examined. Figure 5 shows how the HPLC-UV peaks are unstable and often overlap, this decomposition process results in partial disintegration of the mesalazine compound and uncontrolled interaction with pharmaceutical additives.

Thermal degradation:

500 mg MESA tablet powder was baked for 2–3 hours at 105°C in a glass Petri dish. In a 100 ml volumetric flask, the tablet powder was dissolved, and a solution was composed. to the stain

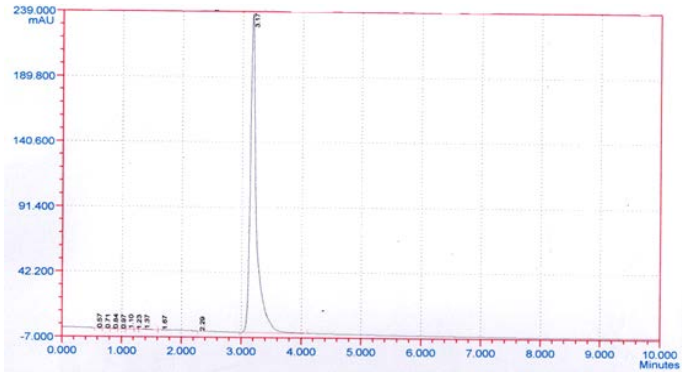

Figure 2. *Acid degradation.*

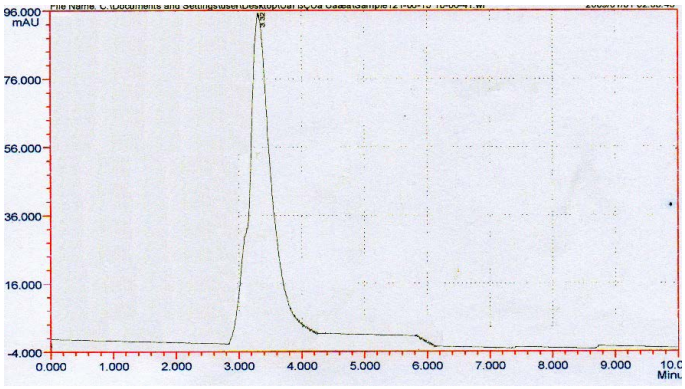

Figure 3. *Base degradation.*

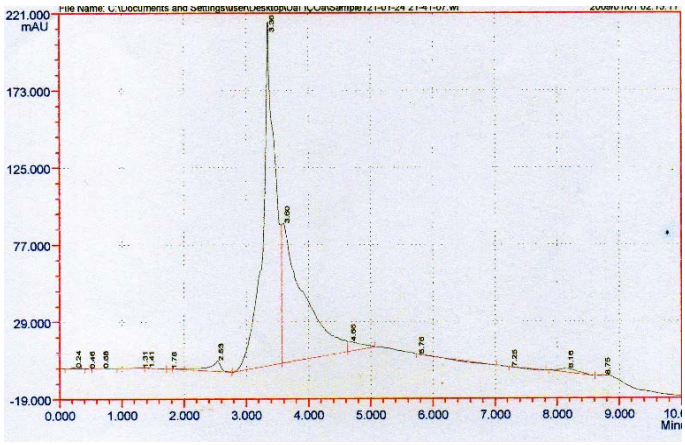

Figure 4. *Oxidative degradation.*

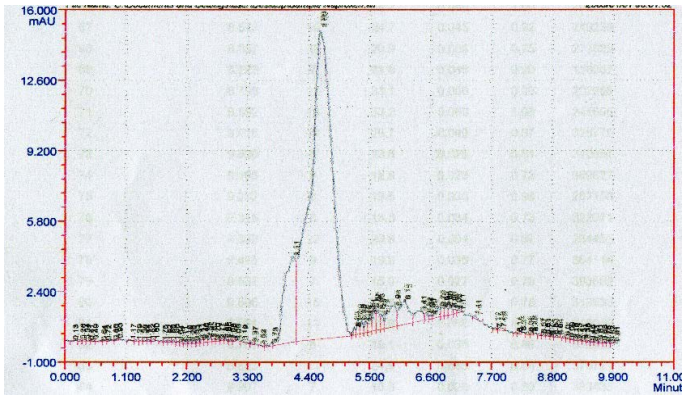

Figure 5. *Photolysis degradation.*

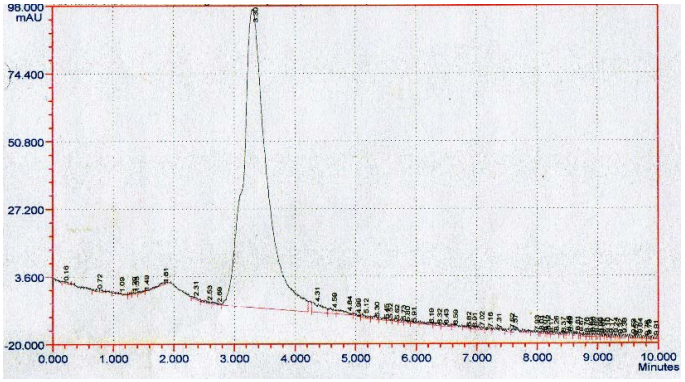

Figure 6. *Thermal degradation.*

after a given time with the handheld portion. Controlling the Mesalazine 's synthetic structure and thus achieving complete thermal dissolution of the compound becomes difficult as the temperature of the mesalazine solution rises above 100°C, as it is appeared in Figure 6.

MESA Infrared Spectrophotometer:

In the shape of a potassium bromide plate, the compounds are prepared. KBr's infrared measurements were performed at Basrah University / College of pharmacy in the area (4000500 cm^{-1}) at room temperature with a system of the type FTIR-84005-SHIMADZU, made in Germany. The active groups can be seen in the FT-IR spectrum of the compound Mesalazine (Figures 7 and 8) [21-25].

For Mesalazine -Standard:

Mesalazine -Standard's infrared spectrum, important peaks for stretching and bending vibrations can be seen in (Figure 7), which are compatible with the structure. Standard FT-IR mesalazine 's spectrum appears to be small, with peaks at 3415 cm^{-1} (M) for (OH) Carboxylic acids and 1604 cm^{-1} (S) for (C=O) Carboxylic acids, the 1730 cm^{-1}(S) for (C=O) Carboxylic acids, the 1205 cm^{-1}(M) and 759cm^{-1}(M) for (C-N), the 3415cm^{-1}(m) for (N-H), Aromatic stretching of C-H is allocated to 3062 cm^{-1}(W), while aliphatic stretching of C-H is allocated to 2962 cm^{-1}(M). Aromatic C=C peaks occur in the range 1411 cm^{-1} (M).

For mesalazine -Sample:

The Mesalazine sample's infrared spectrum (Figure 8) displays peaks that correspond to the standard model's peaks, with vibrations that lead to the structure's extension and curvature Standard-FT-IR Mesalazine 's spectrum seems to be small, with peaks at 3460 cm^{-1} (M) for (OH) Carboxylic acids and 1604 cm^{-1} (S) for (C=O) Carboxylic acids, the 1732 cm^{-1}(S) for (C=O) Keton, the 3450 cm^{-1} for OH Alcohol (S) Brod band, the 1205 cm^{-1}(m) and 759cm^{-1}(M) for (C-N), the 3419 cm^{-1}(m) for (N-H), Aromatic stretching of C-H can be assigned to 3059 cm^{-1}(W) and aliphatic stretching of C-H to 2962 cm^{-1}(M). Aromatic C=C peaks occur in the range 1409 cm^{-1} (M).

Debate on the Findings.

Improvements to HPLC conditions:

To isolate all of the degradation products from the Mesalazine peaks, chromatographic conditions were established. The Ion Pac Arcus EP-C18 has a length of 5 meters, a diameter of 4.5

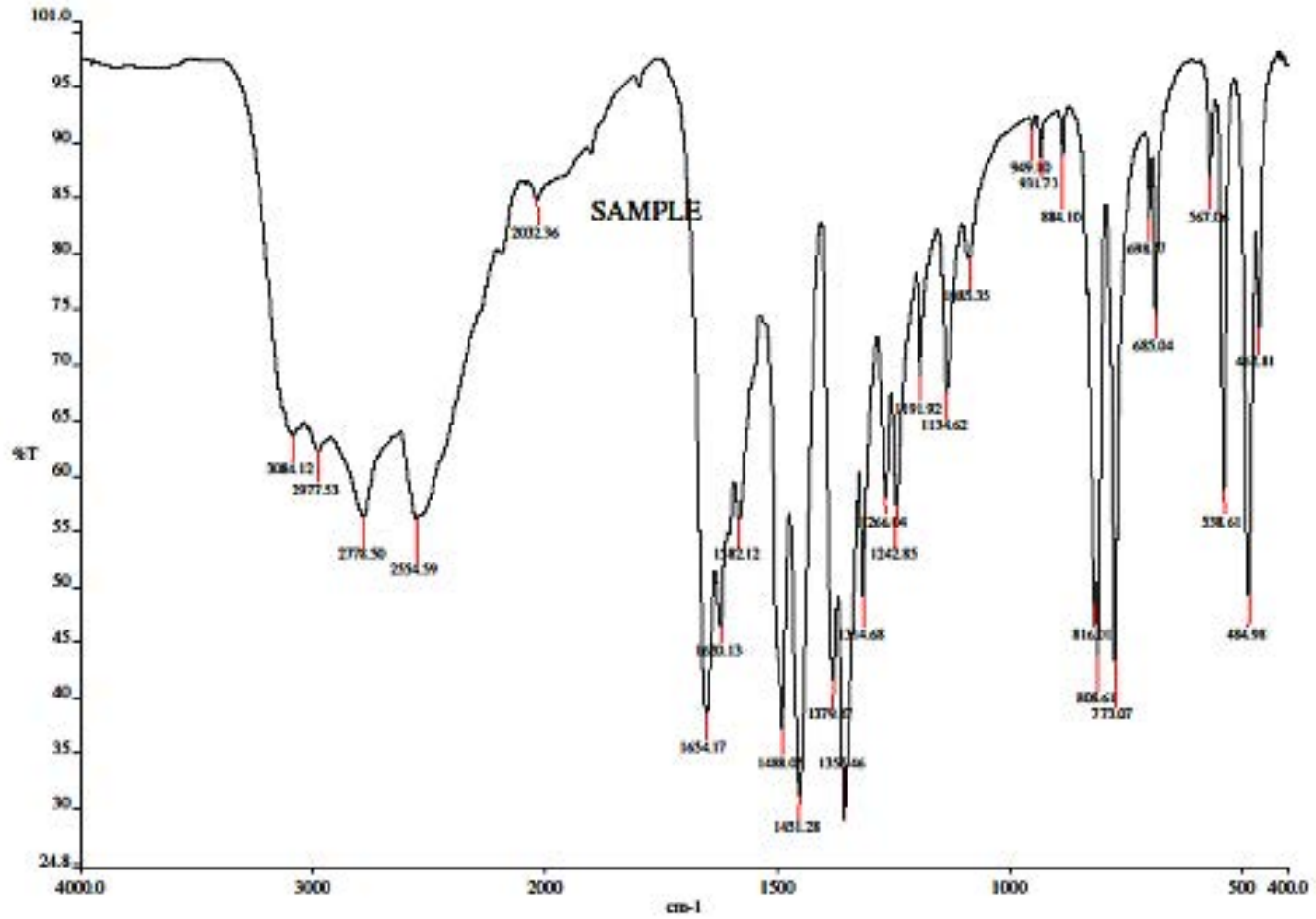

Figure 7. *FT-IR For Mesalazine Standard.*

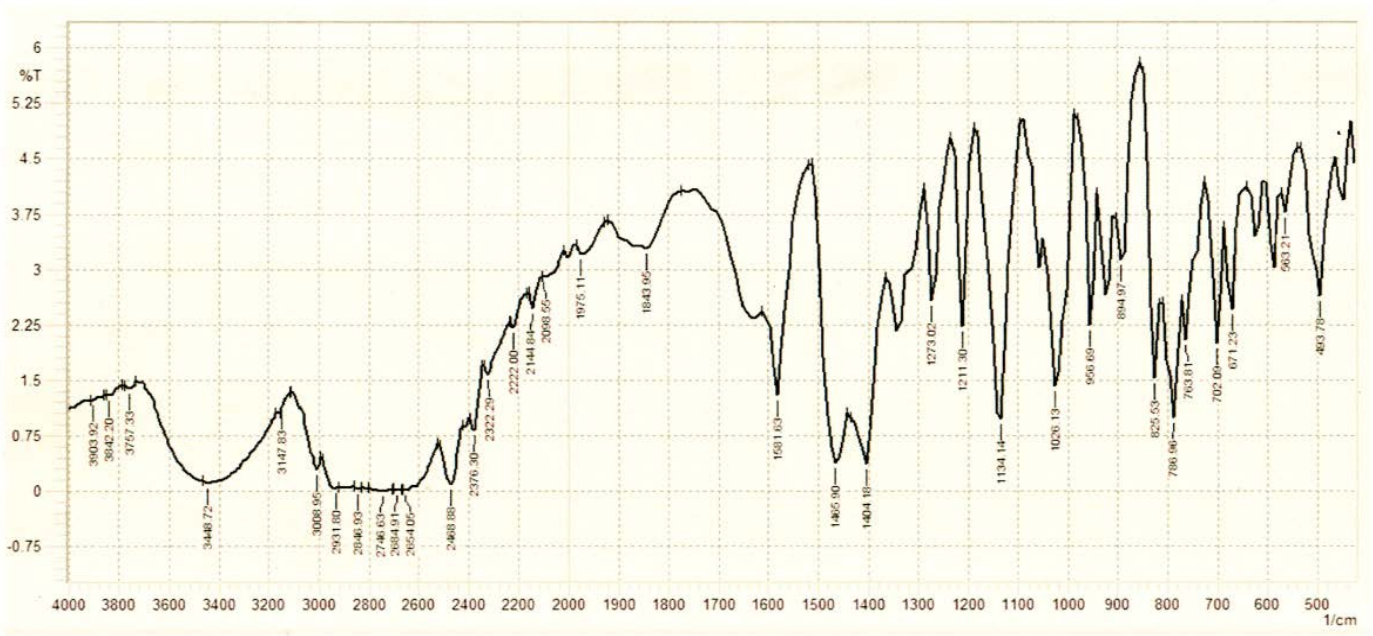

Figure 8. *FT-IR For Mesalazine sample.*

millimeters, and a diameter of 250 millimeters, as well as the requisite organic step. Methanol was used in several trials, during the process of HPLC technique optimization: acetonitrile: acetic acid: water, 40:40:20 (v/v/v) + 0.5 M potassium dihydrogen orthophosphate buffer at pH 3.3, and 1 ml/min flow rate during the process of HPLC technique, the wavelength was measured to be 260 nanometers [26]. Mesalazine had a retention time of 3.17 minutes. The new analytical method produced a good peak shape (Figure 9).

Suitability of the System:

The HPLC-UV device was subjected to research in order to adapt it. Three replicas of the same concentration were repeated using the ideal method using the normal Mesalazine (3 g/mL). The machine suitability is shown in Table 2. These findings follow the separation method's criteria as well as Mesalazine estimates in different pharmaceuticals [27].

The Validation of Methods and Assays:

Specificity, linearity range, and sensitivity, as well as regression, precision, accuracy, and rigidity, were employed specifically in order to validate the new chromatographic technique HPLC-UV in accordance with ICH: To determine process validity, the impact of experimental conditions on the peak areas of the analytes was investigated. At a Mesalazine concentration of 3 g/ml, the technique's validity was checked. Table 4 listed all of the research results. The results showed that minor changes in flow rate, mobile phase work of art, temperature, and detection wavelength had no impact on the drug peak areas, indicating that the method was valid.

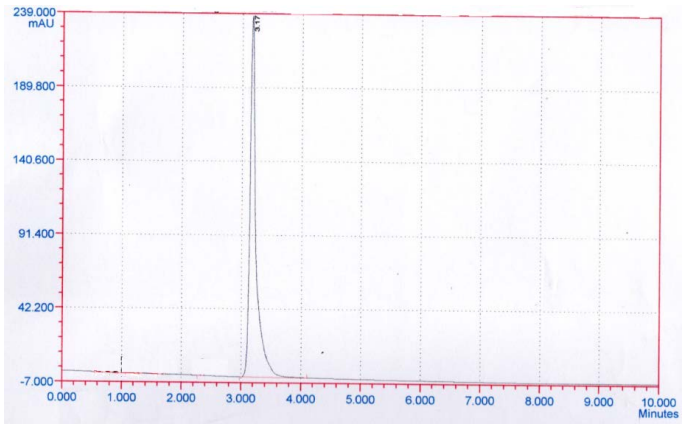

Figure 9. *Optimum conditions for Mesalazine in the HPLC-UV method.*

Table 2. *System suitability analysis of MESA.*

Injections	Drug	RT	Area	% area	USP plate count	USP tailing
1	MESA	3.10	52628.2	99.400	3906	0.40
2	MESA	3.225	108628.3	99.850	3903	0. 40
3	MESA	3.17	160228.2	99.900	3907	0. 40
4	MESA	3.20	212628.4	99.750	3908	0. 40
5	MESA	3.12	267628.5	99.525	3905	0. 40
MEAN			160348.32	RT- Retention Time 3.17 ± 0.45 min		
SD			0.41			
% RSD			0.40			

Table 3. *Linearity of MESA (n=3).*

Sl. No.	Concentration µg/ml	Area
1	1	52628.2
2	2	108628.3
3	3	160228.2
4	4	212628.4
5	5	267628.5

$y = 53440x$ ($R^2 = 0.9998$) for Mesalazine

Table 4. *Regression characteristics of linearity of MESA.*

Parameters	Results
Linearity range (µg/ml)	1- 5
Regression equation (y=mx+b)	$y = 53440x$ ($R^2 = 0.9998$)
Slope (m)	53409.4
Intercept (b)	53440
The correlation coefficient (R^2)	0.9998
limit of detection (LOD)	0.3613
limit of quantitation (LOQ)	1.636

Table 5. *Recovery study results of MESA.*

Sl. No.	Accuracy range	Amount of APB added (mg)	Amount recovered (mg)	% Recovery
	50 % Accuracy	50	49.5	99.0
		50	49.6	99.0
		50	49.4	98.0
	100% Accuracy	100	100	100
		100	100	100
		100	100	100
	150% Accuracy	150	150	100
		150	150	100
		150	150	100
Mean				100
SD				0.41
% RSD				0.40

The Specificity:

Forced deprivation was used to investigate the specificity of the proposed plan. The research was carried out to ensure that During the forced degradation analysis, Mesalazine could be distinguished from the potential degradation products using the proposed process. The tablet sample was tested using acid, base, oxidation, photolysis, and heat at a concentration of 3 g/ml Mesalazine. The outcomes of forced decomposition are shown in Table 5. The shapes of chromatograms are depicted in Figures 2-6, and figure 9. The drug's alkaline conditions resulted in the highest percentage of degradation [28,29]. The lowest percentage of mesalazine degradation occurred when it was exposed to heat and when it was exposed to photosynthesis. Decomposition goods showed a single peak of degradation. Other stress-related degradation products do not interfere with Mesalazine identification, so the tool can be used as a stability indicator.

The Linearity Range and Sensitivity:

A solid relationship was formed when the pinnacle regions for the drug were plotted against the medication fixation (g/ml) under ideal test conditions. The target range of Mesalazine

was discovered to be (1–5) g/ml. The following conditions were obtained from the straight relapse investigation of the information.

On the basis of the following assumptions: y = peak area, x = drug convergence (g/mL), and R^2 = regression coefficient [30]. The high relapse coefficient estimations with a small catch illustrate the adjustment bend's great linearity, as shown in Figure 10, and table 3.

The Regression:

Calculating the limit of quantitation (LLOQ) and edge of detection helped determine the proposed process's comprehension (LLOD). The following equations were used to measure the LOD and LLOQ [31].

LLOD=3.3SD/S; LLOQ=10SD/S

Where SD denotes the drug rejoinder's standard deviation and S denotes the calibration curve's slope. The LLOQ values were found to be 0.3613 g/ml, while the LLOD values were 1.636 g/ml. These figures show that the sensitivity of the predicted technique for studying the chosen drug is adequate. The regression statistics of the anticipated method are shown in Table 4 [32].

The Accuracy:

Three separate quantities of a recognized volume of standard solution were put to the pre-analysis tablet sample solutions, 10 percent, 20 percent, and 30 percent. The predicted methodology was used to re-analyze the solutions. With a percentage of RSD of 0.40 percent, the percentage recovery was between 98 and 100 percent. The results show that the procedure is very accurate. The non-interference of the excipients was determined by analyzing the analytes to determine the process' selectivity [33]. Table 5 shows a summary of the findings.

Table 6. *Method precision.*

SL. NO.	Sample weight (mg)	Area	Mean Area Counts	% Label Claim
1	100	52628.2	160228.2	100
2	100	108628.3	160228.2	100
3	100	160228.2	160228.2	100
4	100	212628.4	160228.2	100
5	100	267628.5	160228.2	100
MEAN				100
SD				0.41
% RSD				0.40

Table 7. *Intermediate precision.*

SL. NO	Sample weight (mg)	Area	Mean	% Label Claim
1	100	52628.2	160348.32	100
2	100	108628.3	160348.32	100
3	100	160228.2	160348.32	100
4	100	212628.4	160348.32	100
5	100	267628.5	160348.32	100
6	100	52628.2	160348.32	100
Mean				100
SD				0.41
% RSD				0.40

Table 8. *Assay of MESA in tablets.*

Analyte	Labeled claim (mg)	Found (mg)	Mean (mg)	%Recovery	%RSD
Standard - MESA	500	500	500	100	±0.401
MESA -500	500	500	500	100	±0.402

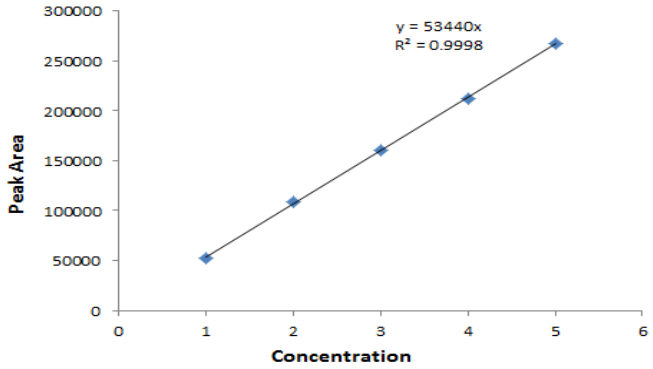

Figure 10. *Linearity of the calibration curve.*

The Precision:

Mesalazine was analyzed at a concentration of 3 g/ml to determine precision. The precision of the method was checked by using the established technique for estimating Mesalazine in pure standard mesalazine three times (n=3). The method's precision was checked by repeating the mesalazine investigation in tablet samples three times (n=3). Table 6 and 7, show a summary of the findings. System and method precision percentage RSD values were both less than 0.40 percent, suggesting that the proposed Mesalazine investigation strategy is extremely precise [34,35].

Discussion and Applications of Method:

Examining commercially available Mesalazine -500 mg tablets was used to test the analytical process (Mesalazine-Pentasa-tablets Ferring®). The proportion of Standard- mesalazine was discovered to be 100, ±0.401percent, while the ratio of Mesalazine in Mesalazine-500 (Mesalazine - Pentasa-tablets Ferring®) was discovered to be 100, ±0.402percent. This result indicates that the proposed approach was reliable and precise in analyzing mesalazine in dosage types, as shown by the percentage recovery and RSD percent values. The results of the applications were presented in Table 8.

The presence of Mesalazine in two commercial pharmaceutical products was determined using an HPLC system (LC100 Angstrom advanced) with a UV detector in this analysis. This tried-and-true approach is easy to use, low-cost, and only needs a small amount of sample. It also employs an ultraviolet detector, which, due to a single peak in the chromatogram, makes this system extremely sensitive. Since pharmaceutical drugs have such low concentrations, high sensitivity is not needed in this application. The method was validated using HPLC-UV guidelines, and the established technique meets Beer's law for drug fixation in the range of 1.0–5.0 g/mL.

Conclusion.

The study shows the critical analytical approach used to determine the existence of Mesalazine in the measurements structure in the light of the findings. Easy, accurate, exact, delicate, explicit, rough, and hearty describes the established and authorized HPLC-UV safety showing technique for Mesalazine measurement. In this way, the proposed technique can be used on a routine basis to analyze Mesalazine in the tablet dose structure.

Acknowledgments.

Assist Professor H. N.K. AL-Salman from the College of Pharmacy's Pharmaceutical Chemistry DEP/ University of Basra, Iraq. assisted the authors in the preparation of this manuscript and therefore they are thankful for such assistance.

Efforts of the Researchers.

The research was conducted in the College of Pharmacy at the University of Basrah. This research took three months to complete with significant and consistent effort, and the results were excellent in terms of evaluating a clear and sensitive method for estimating the Mesalazine.

REFERENCES

1. Jain S, Jain N, Khambete H, et al. Spectrophotometric method for simultaneous estimation of Mesalamine and Prednisolone in combined oral dosage form. Int. J. Pharm. Sci. Res. 2012;3:3707-3711.
2. Moharana AK, Banerjee M, Panda S, et al. Development and validation of UV spectrophotometric method for the determination of Mesalamine in bulk and tablet formulation. Int. J. Pharm. Sci. 2011;3:19-21.
3. Purushotham Reddy M, Prabhavathi K, Rami Reddy N, et al. Two simple spectrophotometric methods for the estimation of Mesalamine in bulk sample and its pharmaceutical dosage forms. Global J. Pharmacol. 2011;5:101-105.
4. Venugopal D, Arvind BK, Appal Raju S, et al. Development and validation of HPLC method for determination Mesalamine in tablet dosage forms. Pharm. Sci. Monitor. 2012;31:74-81.
5. Alok Kumar M, Mrityunjay B, Chinmaya Keshari S, et al. Development and validation of RPHPLC method for Mesalamine. Asian J. Pharm. Clin. Res. 2011;4:71-73.
6. Trivedi RK, Patel MC, Kharkar AR. Determination of Mesalamine related impurities from drug product reverse phase validated UPLC method. E. J. Chem. 2011;8:131-148.
7. Al-Enizzi M.S, Al-Sabha T.N, Al-Ghabsha T.S. Use of charge transfer complex formation reaction in spectrophotometric micro determination of some drugs. Jordan J. Chem. 2012;7:87-102.
8. Al-Sabha T.N, Habeeb N.N. Spectrophotometric determination of mesalamine using sodium nitroprusside as chromogenic reagent. European Chem. Bulletin. 2015;4:7-9.
9. Balaji J, Shivashankar M. Development and validation of RP-UHPLC procedure for estimation of 5-aminosalicyclic acid in rectal suppositories. Materials Sci. Engi. 2017;263.
10. Banda J, Lakshmanan R, Katepalli R.P, et al. Determination of mesalazine, a low bioavailability olsalazine metabolite in human plasma by UHPLC–MS/MS: Application to a pharmacokinetic study. J. Chromatography B. 2016;1008:1-10.
11. Darak V, Karadi A, Raju S, et al. Development and validation of HPLC method for determination of mesalazine in tablet dosage forms. Pharma. Sci. Monitor an Int. J. Pharma. Sci. 2012;3:74-81.
12. Elbashir A.A, Abdalla F.A.A, Aboul-Enein H.Y. Supramolecular interaction of 18- crown-6 ether with mesalazine and spectrofluorimetric determination of mesalazine in pharmaceutical formulations. J. Biol. Chem. Luminescence. 2015;30:1250-1256.
13. Gurupadayya B.M, Sama N.S, Kumar C.A. Spectrophotometric determination of mesalamine by PDAC and NQS reagents in bulk and tablet dosage form. J. Pharmacy Research. 2011;4:39-41.
14. Hamdoon E.A. Indirect spectrophotometric determination of mesalazine via chromate-1,5- diphenyl carbazide complex. Raf. J. Sci. 2018;27:69-78.
15. Mhatre P.R, Gatkal S.H, Chopade V.V, et al. Development and alidation of a stability indicating assay method of mesalamine by using different stress degradation conditions. Int. J. Pharm. Sci. Res. 2013;4:401-406.
16. Moharana A.K, Banerjee M, Sahoo N.K. Development, and validation of visible spectroscopic method for the determination of mesalamine in Bulk and tablet formulation.Asian J. Research in Chem. 2011;4:647-649.
17. Rao K.H, Sekhar KB.C. Validated RP-HPLC method for the estimation of mesalamine in bulk and tablet dosage form. International J. Research in Pharm. Chem. 2013;3:472-476.
18. Shihab I.A. Spectrophotometric determination of mesalazine via oxidative coupling reaction. Tikrit. J. Pur. Sci. 2011;16:64-69.
19. Tanuja S.B, Swamy B.E.K, Pai K.V. Electrochemical studies of mesalazine at sodium dodecyl sulfate modified carbon paste electrode: A cyclic voltammetric study. Anal.Bioanal. Electrochem. 2018;10:64-76.
20. Zakaria R.A. Spectrophotometric determination of mesalazine by 8- ydroxyquinoline and N-(1-naphthyl) ethylenediamine. dihydrochloride reagents in bulk and capsule dosage forms. Raf. J. Sci. 2013;24:146-158.
21. A. K. Moharana, M. Banerjee, S. Panda, et al. “Development and validation of UV spectrophotometric method for the determination of mesalamine in bulk and tablet formulation”. Int J Pharm Pharm Sci. 2011;3:19-21.
22. K. H. Rao, A. L. Rao, K. C. Sekhar. Int. J. Res. Pharm. Chem. 2013;3:472-480.
23. N.S. Sama, B.M. Gurupadayya, C.A. Kumar. “Spectrophotometric determination of mesalamine by PDAC and NQS reagents in bulk and tablet dosage form”. Journal of Pharmacy Research. 2011;4:39-41.
24. S. R. Narala, K. Saraswathi. Development and Validation of Spectrophotometric methods for the Estimation of Mesalamine in Pharmaceutical Preparations J. Chem. Pharm. Res. 2011;3:784-787.
25. E. A. Hamdon, S. A. Zakaria, N. M. Al-Hamdany. “Spectrophotometric Determination of Mesalazine With Phloroglycinol in Pharmaceutical Preparation”. Tikrite J. Pure Sci. 2012;17:133-136.

26. Al-Salman H.N.K, Hussein H.H, Maan A.N. Quantitative analysis of cephradine using the modern high-performance liquid chromatographic method. Asian J. Pharm. 2018;12:228-234.
27. Kancharla P.K. Kondru, Raju V.G, Dannana, et al. Novel LC-ESI-MS/MS method for desvenlafaxine estimation human plasma: application to pharmacokinetic study. Biomed. Chromatogr. 2016;30:249-255.
28. Hobelmann J.G, Clark M.R. Benzodiazepines, Alcohol, and Stimulant Use in Combination with Opioid Use. ed. By Staats P., Silverman S. Controlled Substance Management in Chronic Pain. Cham: Springer. 2016:75-86.
29. Galanter M, Kleber H.D, Brady K.T. The American Psychiatric Publishing Textbook of Substance Abuse Treatment. Washington: American Psychiatric Publishing. 2014.
30. Tsutaoka B, Olson K.R. Chapter 31. Benzodiazepines. Poisoning & Drug Overdose. McGraw-Hill, 2012.
32. Theis D.L, Bowman P.B. Development of a liquid chromatographic method for the determination of triazolobenzodiazepines. Journal of Chromatography A. 1983;268:92-98.
33. Anon, Commission Regulation (EU) No 37/2010 of 22 December 2009, "On pharmacologically active substances and their classification regarding maximum residue limits in foodstuffs of animal origin," Official Journal of the European Communities. 2010:1-72.
34. E.A. Abdelaleem, N.S. Abdelwahab. "Simultaneous determination of some antiprotozoal drugs in different combined dosage forms by mean centering of ratio spectra and multivariate calibration with model updating methods," Chemistry Central Journal. 2012;6:1-8.
35. A.K. Mishra, A. Kumar, A. Mishra, et al. "Development of ultraviolet spectroscopic method for the estimation of metronidazole benzoate from pharmaceutical formulation," Journal of Natural Science, Biology, and Medicine. 2014;5:261-264.